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PREPARATION OF PAMS BEADS AND SHELLS AND EFFECTS OF PLASMA COATING

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To successfully develop the depolymerizing mandrel method for preparing microshells, techniques needed to be developed for preparation of smooth, spherical poly(alpha-methyl styrene) (PAMS) mandrels. Initial experiments used hot water to soften the PAMS and allow surface tension to form the material into a sphere. When multiple beads were present in hot water, the particles aggregated. Use of PVA as a surfactant prevented aggregation and also improved the surface finish. Surface finish can be further improved by passing the beads through solvent vapor, solvating the outer layer, followed by drying in a drop tower.

Recent experiments have concentrated on two techniques for making hollow shells which have the advantage of having much less material to ultimately pyrolyze. Shells were first made by microencapsulation techniques. We also used a swollen frit method where pieces of PAMS swollen with toluene were blown into shells in a hot drop tower.

The beads or shells were next coated with plasma polymer. To deposit a uniform coating, the beads needed to be kept in constant random motion. Use of a slowly rolling pan resulted in poor coating uniformity and caused collapse of the coating during pyrolysis. During coating bubbles developed inside the PAMS bead if the coater power is high. This caused the bead to swell, fracturing the coating and leading to nonuniformity because of the off center bubble.

The thermal properties of plasma polymer were studied to determine wheather shrinkage of the coating during the final pyrolysis phase could be reduced. We saw little difference between the plasma polymer collected from several different coaters runing at different conditions. Shrinkage of coating was typically 10 %.

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